

Uttarakhand: A Fragile Eco-Zone

Dr. Richa P Ranade

SMCC Government College, Abu Road, (Rajasthan) India

Abstract

Environmental impacts are either biotic or abiotic in nature and are normally attributed to anthropogenic factors. Loss of biodiversity, land use/cover changes and forest loss have been largely due to human activities. Some of the vital examples of environmental degradation, which are human-induced and human-accelerated in the recent past, can be traced in India and strikingly in the state of Uttarakhand. The Garhwal region of Uttarakhand has experienced eighteen major earthquakes since the devastation in 1803 that wiped out a third of Uttarakhand's population. The Uttarkashi tragedy in October 1991, reached 6.6 on the Richter scale, killing over 2,000 people. Such diverse and large scale environmental impacts need to be addressed and mitigated if a proper mix of development with least environmental impact has to be achieved. Proper management of mountain resources and socio-economic development of the people deserves immediate attention and action. It is also clear that these strategies will have to be based on the region's natural resources—forests, water, biodiversity, organic and speciality foods, nature tourism—but will need to address the specific threats so that growth does not come at the cost of the environment.

Key Words: Uttarakhand, environment, eco-degradation, tradeoffs, development agenda conflicts, governance, human rights and environmental impact

Mountains are a major part of our ecosystem, an important source of water, energy, mineral resources, forests and biological diversity. The Himalayas is one of the youngest mountain ranges in the world, being fold mountains formed by large-scale geological plate movements. Still growing, they currently rise at a rate of five millimetres per year. The Himalayan Range is still evolving, which means that because of tectonic pressure and dynamics, the mountains have not stabilised. This is in sharp contrast with the igneous rock based mountain ranges such as the Aravallis, Vindhya and Satpuras, which are amongst the oldest mountain ranges in the world and are relatively stable. By contrast, the Himalayas are still in a state of eternal

change. Hill slopes in the Himalaya are known for their instability due to ongoing tectonic activity. However, increasing anthropogenic intervention in the recent times appears to be contributing to terrain instability in addition to natural factors, as observed by increasing frequency and magnitude of landslides since 1970.

The Garhwal region of Uttarakhand has experienced eighteen major earthquakes since the devastation in 1803 that wiped out a third of Uttarakhand's population. The Uttarkashi tragedy in October 1991, reached 6.6 on the Richter scale, killing over 2,000 people. Most of those who died were crushed under the collapsed slate roofs of their homes.

The tectonic fault lines, which are active and see back-and-forth movements, have

been cut in many places by roads. More dangerously, roads are built along the fault lines at many places. As a result, tiny seismic movements in the fault lines weaken the rocks at the base of the roads, making these stretches susceptible to cave-ins and slides.

It is also a fact that the Himalaya is the watershed which provides India with large perennial rivers which are full of water even in the summer through melting snows. In contrast, the rain fed rivers of peninsular India carry a much smaller post monsoon flow and if the monsoon is not regular and the catchment has been deforested, many of the rivers just run dry.

This area is characterized by different types of rocks, undulating terrain, and cool climate.

The removal of the forest cover has accelerated the rate of erosion and mass wasting in the area. Steeper slopes, high relative relief and presence of weathered, fractured/sheared rocks in addition to unfavourable hydrological conditions are characteristic features of the area. A number of landslide zones are observed in the area. Debris flows, rockfalls, toppling failures and ground subsidence are frequently observed. Every year, a number of landslides cause heavy damage to life and property.

Environmental impacts are either biotic or abiotic in nature and are normally attributed to anthropogenic factors. Loss of biodiversity, land use/cover changes and forest loss have been largely due to human activities. The underlying causes for climatic changes are however, still not clearly understood. Scientists, generally, describe many anthropogenic activities

such as forest loss and emission of carbon gases as basic causes of climatic change. Climate change was in process even from the primitive stages of human evolution. Thus, it can be said that climate change is a natural process and is not derived by anthropogenic activities solely. However, anthropogenic activities, certainly, have given pace to climate change. Some of the vital examples of environmental degradation, which are human-induced and human-accelerated in the recent past, can be traced in India and strikingly in the state of Uttarakhand.

Environmental degradation cannot be attributed to one single factor. Many factors have each contributed significantly to the impacts on the environment. The British Forest Policy between 1818 and 1859 can be seen as, probably the earliest of the contributory factors to this eventual environmental destruction, huge loss of forests and bio-diversity. The East India Company ruthlessly destroyed the ecology and economy of Kumaon and Garhwal regions in what is now Uttarakhand. Large scale felling of sal and teak trees for the manufacture of railway sleepers caused widespread destruction in Garhwal, in the Central Indian Forests and South India. Massive deforestation and policy of silvi culture felled pristine forests and converted them into uniform sal and mono culture of pine forests. A.E. Osmaston while preparing a working plan for Garhwal in 1921-22 had said, "It is the Himalayan broad leaved forests which protect the myriads of mountain streams which go to maintain the village 'sera' and the water system of the hills, which, in turn, goes to feed the Ganges". Broad leaved forests were destroyed, eventually leading to widespread water scarcity,

drought and depressed agriculture. Mono culture forests were susceptible to mass natural destruction due to occurrence of storms and the eventual failure of mono culture forestry. Young, unstable mountains have a tendency to suffer from landslides. Soil stability is ensured by vegetation, ranging from grasses to shrubs to trees. Whereas the lower slopes have a combination of broad leafed trees and, as one moves up of pinates and ever greens, the higher slopes naturally are largely pinate ever greens, such as deodar, blue pine, fir, etc. Wherever there is vegetation, there is relative soil stability.

The Indo-China war of 1962 can be traced as another bench-mark in the history of environmental changes in the whole of the Himalayan region. India's defeat in war led to the introduction of gigantic network of roads deep into the hills of Himalaya, which claimed huge deforestation and biodiversity loss in almost every corner of the Himalaya.

High altitude roads were initially constructed by the armed forces to gain accessibility to remote areas. However, subsequent opening up of these roads for civilian access meant not only increased human access to the earlier untouched ecology but also a start to incessant destruction under the guise of religious tourism. Lackadaisical approach and general administrative apathy has led to rampant encroachment and destruction of forest and agricultural lands and includes illegal constructions along river banks with total disregard to developmental and ecological concerns and impacts. The results were quite evident in the 2013 massive destruction along the river banks due to flooding accompanied by loss of

human life accompanied by severe irretrievable damage to land and property.

Buildings have been constructed over flood ways, old drains and streams, blocking the natural pathways of rainwater. It's also true that once the river is flooded it will again be flooded in coming 100 years. People and local administration neglected this theory in ongoing constructions on the old flood ways. When the river returned to its old course following the deluge, these constructions were washed away. Aggravating this were two huge downpours of water and rocks from the high mountains, in all probability caused by glacier lake outburst floods (GLOFs), which deluged Kedarnath. GLOFs, or the explosive bursting of glacier lakes, are a consequence of human-induced climate change, which is causing rapid glacier melting in the Himalayas.

While the administration insists it was a natural disaster, environmentalists are firm that it was entirely man-made. Though it was nature's fury but the after effects were purely man made. It happened because geology of the area was always neglected in construction and expansion of the affected areas. Observations suggest that inadequate consideration of geology and geomorphology during the road alignment and poor, faulty engineering techniques were major factors responsible for the landslides and disaster.

Hill areas are traditionally low income areas with little scope for livelihood and sustenance of large population. Civilian access of earlier military controlled roads has ensured that there is a spurt in tourism related activities and an increase in population with increased opportunities of

such livelihood. The state government has zealously promoted tourism to a point when tourist arrivals reached 25 million, almost two-and-a-half times Uttarakhand's entire population of 10.8 million, devastating the ecology and devouring tens of thousands of acres of forest land. Hotels, houses, shops and restaurants were recklessly built upon caving roadsides, steep slopes, and worst of all, on the flood plains of rivers. Encroachment of these "natural boundaries" of rivers is fraught with grave danger. Yet, important government buildings, including a university, a radio station, a jail and the headquarters of the Sashatra Seema Bal, were built on flood plains.

Opening up of remote areas and increased accessibility increases the demand for not only temporary accommodation to cater to increased traffic but also construction of permanent and semi permanent residential and commercial structures. In the absence of administrative control haphazard development takes places much to the detriment of the environment. The hills have seen a frenzied growth of construction activity in which hill sides were cut, the land rendered hollow by excavation for building materials and the rivers became constricted as whole new towns grew on their banks and sometimes even in their beds. Massive deforestation took place in order to accommodate all these new activities and the hills became exposed and scarified. Then came the rains, and what rains! The sodden earth of the mountains, whose angle of repose is steep and has stability only because of the binding force of vegetation, suddenly became subject to a classical slip circle as the soil became supersaturated and then there was drawdown. Naturally massive

landslides took place and the combination of rushing waters and falling hills swept away everything in their path. Roads, bridges, buildings, vehicles, all disappeared.

For the last few years there is a rapid change in the various mountain ranges. They are susceptible to natural and man-made calamities. Rapid deforestation, landslide, soil erosion and commercialization in the form of mountain tourism have adversely effected the habitat and genetic diversity of the mountains. As a result, most global mountain areas are experiencing environmental degradation. Hence, the proper management of mountain resources and socio-economic development of the people deserves immediate attention and action.

Another area of major concern for the environment is the wholesale construction of dams in Uttarakhand. 70 dams have been built, including 23 mega-projects generating 100 MW or more. According to the NGO People's Science Institute, another 680 dams are in various stages of commissioning, construction or planning. Thus, more than 700 existing, proposed and under construction dams and hydro-electricity projects (HEPs) in Uttarakhand have not only put its highly sensitive Himalayan eco-zone into danger by submerging thousands of hectares of forests and agricultural land, devastating its fragile mountains, creating landslides and inducing earthquakes as massive amount of water is stored in their reservoirs, these have also uprooted thousands of people from their homes as they have to leave their villages that were directly and indirectly 'affected' by these dams and HEPs. Hydroelectric dams have

a profoundly negative impact on geology, especially in a Himalayan hill state like Uttarakhand due to “Reservoir Induced Seismicity” or RIS. To appreciate this, it's important to note that geologically, Uttarakhand is extremely fragile, being part of the world's youngest mountain range. Much of the state lies in the seismically "most active" Zones IV and V, with high tectonic activity that can suddenly alter the contours of land and the course of rivers. This greatly increases Uttarakhand's disaster potential.

Yet, dam construction has taken place without factoring in these grave environmental hazards. In 2009, the CAG's audit of hydel projects in Uttarakhand concluded: 'No specific measures had been planned/designed ... to cope with the risk of flash floods. The adverse consequences of such floods are acute as they cannot only damage the project structures but can cause loss of lives in low-lying downstream areas...'. The audit adds: 'Given the current policy of the state government of pursuing hydro-power projects indiscriminately, the potential cumulative effect of multiple run-of-river power projects can turn out to be environmentally damaging.'

A Wildlife Institute of India report (2012) recommended that 24 of the 70 Upper Ganga projects should be shelved because of their high ecological impact. They together affect nearly 10,000 hectares of land in this small state, and submerge more than 3,600 hectares of forests.

The then UPA Government was forced to notify the 100 km stretch from Gomukh to Uttarkashi, comprising a 4179 sq km area, as an Eco-Sensitive Zone (ESZ) where no dams and HEPs would be allowed and

only pro-people micro-level development could be undertaken. Just within six months of its notification, Uttarakhand was hit by its worst natural disaster, killing thousands and displacing even a greater number of people. Although it was a natural disaster, it was aided and aggravated by these dams and HEPs as many studies and reports indicated.

Construction on all dams in Uttarakhand was halted by the Supreme Court in August 2013 and on its instructions, the Ministry of Environment and Forests (MoEF) appointed an expert body headed by Dr Ravi Chopra, which said that 23 hydropower projects out of the 24 it was asked to examine would have an irreversible impact on the biodiversity of the Alaknanda and Bhagirathi basins and should not be constructed, that hydropower projects played a significant role in the Uttarakhand disaster and that there is an urgent need to improve the environment governance of hydropower projects in April 2014. In May, the Supreme Court reiterated its orders stopping work on the 24 hydropower projects examined by the body. The body's report said, “The problem with the dams is their location in a high or very high biodiversity value area, some of them at elevations above 2,200-2,500 metres. These altitudes come in the paraglacial and glacial zones and in these zones, the rivers are capable of mobilizing tremendous amounts of sediments, under intense rainfall conditions, from the moraine left behind in the past by receding glaciers. In such situations, they cause havoc in the vicinity of dams as witnessed at the Vishnuprayag barrage site and below during the June 2013 disaster.”

Hydel power is considered clean energy, a good way to reduce carbon emissions. Urja Pradesh, land of electricity, is what that the state government likes to portray itself as, to prospective investors. However, the underbelly of hydel power, particularly large and medium dams, is the disruptive impact they can have on forests and wildlife. In addition, there is growing awareness that while large dams drastically cut carbon emissions, they can just as drastically increase methane, another so-called greenhouse gas that heats up the planet. "If a large amount of vegetation is growing along the riverbed when a dam is built, it can decay in the lake that is created, causing the buildup and release of methane," says the US Environmental Protection Agency on its website.

Samir Harlankar, writing in Live Mint has brought out this tussle between small and large dams rather succinctly. He says "the solution to such devastation, it was thought, is to make small run-of-the-river dams with far smaller environmental footprints. A study in the journal Water Resources Research says this is a flawed assumption. The construction of small dams may reduce greenhouse-gases, but it can cause unforeseen habitat and biodiversity loss, cumulatively 100 times larger, per MW, than a big dam in some cases. "The preference of small to large dams assumes, without justification, that small hydropower dams entail fewer and less severe environmental and social externalities than large hydropower dams," says an abstract of the study. The study of 31 small dams running on the Chinese stretch of the Nu river is one of the most comprehensive of its kind. Researchers from the Oregon State University (OSU)

spent five years studying the Nu river, which flows to Myanmar and Thailand from China. The Nu river basin is considered one of the most ecologically fragile and diverse places in the world. The findings could be equally applicable to other countries, such as India. "Results reveal that biophysical impacts of small hydropower may exceed those of large hydropower, particularly with regard to habitat and hydrologic change," the study said. This however, does not justify the move towards large dams. Large dams could destabilize a land that is already geologically unstable. This instability emerges from the shifting nature of the Himalayas, which continue to grow as they grind against the Asian landmass."

The state is prone to high-intensity rainfall events, including cloudbursts, flash floods and landslides. As South Asia Network on Dams, Rivers and People puts it, it has a very large number of rapidly flowing silt-laden rivers that can turn into a ravaging, eroding, force of destruction if not handled carefully.

Uttarakhand is a hill state and an earlier high proportion of its area under forests, was necessary for the sustained existence of the local environment, people and biodiversity. People's livelihoods and water security depend on these natural resources. Thus, about 66 per cent of the total geographical area of the state is required to be under forest cover to keep the ecosystem functioning properly. Forest Survey of India (2005) reveals that forest cover accounts for about 24,442 sq km, which is 45.70 per cent of total geographical area of Uttarakhand.

Thus, it can be said Uttarakhand is having a far from healthy ecosystem and forest cover. Improvement of forest cover on additional 20 per cent geographical area is needed to achieve the threshold of a healthy ecosystem, i.e., 66 per cent forest cover in a hill state. Although, it seems far from reach in the near future, since the forest cover shows a virtually stagnant growth in Uttarakhand in the recent past. In 1997, the forest cover was 43.46 per cent of total geographical area of Uttarakhand and it marginally increased to 45.73% during 1997-2003. Loss of forest cover during the said, period can be attributed to rehabilitation of Gujjars, Tehri dam oustees and rotational felling of eucalyptus in Haridwar districts.

This stagnation and reduction in forest cover has also had its climatic impacts like reduced precipitation, reduced tree growth as noticed by paleo-botanical studies, higher seasonal average temperatures, melting and retreat glaciers in the upper reaches of the Himalayas, changes in species composition and the altitudinal movements in the eco system.

Such diverse and large scale environmental impacts needed to be addressed and mitigated if a proper mix of development with least environmental impact has to be achieved.

Development in Uttarakhand, especially in its mountainous regions, is restricted. Presently, only two sectors — tourism and hydropower — have the potential to improve the economic condition of this mountainous region. In these hills, hydropower projects are the only means by which the unused water can be used to uplift the economic status of the people. Run-of-the-river hydropower projects will

not withhold the water and the question of discontinuity of water flow does not arise.

Environmental flows and the dams on the upper Ganga basin decide not just the safety of the people of Uttarakhand, the ecology of the hills and the country's hydroelectric power policy but also life in the entire riparian zone in Uttar Pradesh and Bihar. Hence any moves to control flows in the upstream will not be without wide spread impacts downstream.

But can Uttarakhand or even India afford not to have such dams. As Anand Sankar, a journalist from Dehradun writes in *Business Standard*, "It would have been truly disastrous had the Bhagirathi and Alaknanda combined in spate at Devprayag; it could even have led to serious damage in the plains of western Uttar Pradesh. Refusal to acknowledge this is a stunning failure of the environmental lobby." The Tehri dam, by holding excess flows, actually prevented Haridwar and Rishikesh from being inundated. So, there is a point to saying that dams are risky, but as much of a point in saying that dams bring benefits, too. Then there is the larger question of livelihoods. As a hilly country, Uttarakhand is ecologically sensitive. But its two main sources of income and business are tourism and hydel energy — both capable of damaging the environment. Stop either, and you are condemning the people to poverty.

As Sunita Narain of CSE has rightly mentioned, the recent events in Uttarakhand have shown, more than ever, that we need a development strategy for the Himalayas that takes into account the vulnerability of the region and the need for environment protection. There is no doubt that the region needs economic growth.

But this development cannot come at the cost of the environment. It will only make the already risk-prone and ecologically fragile region more vulnerable and development more “deadly”.

She further writes, "we need to think about a pan-Himalayan strategy so that states can evolve common policies and not follow the race to the bottom. It is also clear that these strategies will have to be based on the region's natural resources—forests, water, biodiversity, organic and speciality foods, nature tourism—but will need to address the specific threats so that growth does not come at the cost of the environment."

It is high time one should look at the problem rationally before it is too late. There is a need to control religious tourism. Long serpentine queues of four wheelers can readily be seen in this area which not only creates pollution, but makes life difficult for the local people as well. It's an alarming situation and in order to avoid further damage to the ecology of the mountains the government should enact stringent guidelines. We should learn from our past experiences. Development is a necessity of the time. But, at the same time one should not forget the fact that new development is done while keeping in mind the ecology as well as the capacity of the area. Research should be conducted to understand the carrying capacity of the Himalayas and development should be planned accordingly. It is a very challenging task for the state government. It requires a complete support of the Central Government.

Every year, hundreds of hectares of forests get affected by forest fires which results in

loss of many lives including endangered species. Sometimes it is natural, sometimes caused by the local communities to clear the land. Sometimes miles of forest are cleared to give way to the construction of roads and hydro power projects without looking at compensatory afforestation.

Today, there is an urgent need to restart and intensify the 1973, Chipko Movement, with the same zeal and involvement of the local people. It will definitely slow down the rapid deforestation, expose vested interests, increase ecological awareness, and demonstrate the viability of people power and give local communities effective control over natural resources like land, water, and forests.

Secondly, the government must provide low-cost materials to small industries and ensure development of the region without disturbing the ecological balance.

Thirdly, there is a need to control and rationalize the growing religious tourism in the area. By increasing the tourism tax, stopping the construction of roads in the interiors of Himalayas so as not to disturb the serenity and spirituality of the region.

Furthermore, the local administration should facilitate the proper safety and sanitation facilities. Make it mandatory for the expeditions to remove and take back all bio-degradable waste.

As Dr Ravi Chopra, Director of the People's Science Institute, Dehradun, an advisor to the Indian Government on its water management programmes, said clearly that the three key water management issues that need urgent consideration are “governance, human rights and environmental impact.”

References:

1. Ajeet Bajpai, Dr NC Wadhwa and Dr VK Mahna, Environmental Impact Assessment: Uttarakhand Disaster (June-July 2013) International Journal of Life Sciences Research ISSN 2348-3148 (online) Vol. 2, Issue 2, pp: (8-15), Month: April 2014 - June 2014
2. Transforming Crisis into Opportunity (Revised Version - June 2012), State Action Plan on Climate Change, Government of Uttarakhand. Retrieved from <http://www.indiaenvironmentportal.org.in>
3. Jayshree Nandi (30 June 2013), Unchecked Infrastructure projects made it worse in Uttarakhand, Retrieved from http://articles.timesofindia.indiatimes.com/2013-06-20/india/40092616_1_flash-floods-uttarakhand-key-tributaries
4. National Workshop on Uttarakhand Disaster : Lessons Learnt (19 Aug 2013), Proceedings of Workshop Report, National Institute of Disaster Management, Ministry of Home Affairs, Government of India, Retrieved from <http://ndma.gov.in/>
5. Himanshu Upadhyaya (21 June 2013), Uttarakhand Tragedy: How We Ignored the Writing on the Wall. Retrieved from <http://www.indiatogether.org/2013/jun/gov-disaster.htm#>
6. Subodh Varma (21 June 2013), Uttarakhand Disaster Plan doesn't exist, CAG warned in April. Retrieved from http://articles.timesofindia.indiatimes.com/2013-06-21/india/40118134_1_cag-report-uttarakhand-state-disastermanagement-authority
7. Radhika Krishnan, Research Scholar, Centre for Science Policy, Jawaharlal Nehru University, Delhi (25 Jun2013), An Avoidable Environmental Tragedy in India, Climate & Capitalism. Retrieved from <http://climateandcapitalism.com/2013/06/25/an-avoidable-environmental-tragedy-in-india/>
8. Sandeep Unnithan (28 Oct 2013). The Storm Stoppers. India Today, Special Report Cyclone Phalin, 34-38
9. Fennell, David (1999): *Ecotourism: An Introduction*, London and New York: Routledge.
10. Guha, Ramachandra (1991): *The Unquiet Woods: Ecological Change and Peasant Resistance in the Himalaya*, New Delhi: Oxford University Press.
11. Melanie DuPuis, E and Peter Vandergeest (eds) (1996): *Creating the Countryside: The Politics of Rural and Environmental Discourse*, Philadelphia: Temple University Press.
12. Mukherjee, Ananya (2009): "Conflict and Coexistence in a National Park," *Economic and Political Weekly*, Vol 44, No 23, <http://www.epw.in/journal/2009/23/special-articles/conflict-and-coexistence-national-park.html>

13. LiveMint : “Panel formed to assess impact of hydropower projects in Uttarakhand” by Mayank Agrawal Tue, Jun 16 2015.
 14. Presentation on “Environmental Impacts of Hydro Power Projects in Uttarakhand: Governance & Audit Issues” by Ravi Chopra, People’s Science Institute at ICED, Jaipur, July 2015
 15. “Uttarakhand: Existing, under construction and proposed Hydropower Projects: How do they add to the disaster potential in Uttarakhand?” , Himanshu Thakkar, South Asia Network on Dams, Rivers and People, August 2013
 16. 2012-13 Annual report of Ministry of New and Renewable Energy: <http://mnre.gov.in/file-manager/annual-report/2012-2013/EN/chapter3.html>
 17. “Displacing People and Destroying Lives, Hydropower Projects in Uttarakhand” Economic & Political Weekly, Vol. 48, Issue No. 29, 20 Jul, 2013
 18. Wildlife Institute of India report (2012)
 19. Report of the Comptroller and Auditor General (CAG) of India Report 2009
 20. “ Environmental Changes and Biodiversity in Uttarakhand” Article Shared by Deeptirekha Jain in Biology Discussions, September 2016.
-